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THE I.C.I. MAGAZINE

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The *I.C.I. Magazine* is published for the interest of all who work in I.C.I., and its contents are contributed largely by people in I.C.I. It is edited by Sir Richard Keane, Bt., and printed at The Kynoch Press, Birmingham, and is published every month by Imperial Chemical Industries Limited, Imperial Chemical House, Millbank, London, S.W.1. Phone: VICtoria 4444. The editor is glad to consider articles for publication, and payment will be made for those accepted.

CONTENTS

FRONT COVER: *Evening Gossip, by Seymour Brickman (Plastics Division)*

OUR CONTRIBUTORS

D. S. Clibborn *of Nobel Division is Senior Assistant to the Works Engineer at Ardeer Factory. He joined the Company in 1932 and has served in several of the Division factories. According to his own account, he "dabbles" in railway modelling.*

Gordon Long, *an Assistant Publicity Controller, is better known to* Magazine *readers as a contributor of humorous pieces. He served in the war in the 3rd County of London Yeomanry (tanks) and the Green Howards before being posted, because of journalistic and linguistic experience, to the Anglo-American service known as Psychological Warfare Branch.*

G. S. J. White, *Dyestuffs Division Director in charge of Development and Technical Service, came straight from Oxford University to the Leather Section of the Dyehouse Department at Blackley 29 years ago. He was appointed Chief Colourist and Head of Dyehouse Department in 1944 and Division Technical Service Director in 1953. He was vice-chairman of the Council of the Society of Dyers and Colourists for 1954–57 and was elected vice-president of the Textile Institute last year.*

'Procion' Dyes

A New Advance towards Better Living

By G. S. J. White (Dyestuffs Division)

'Procion' dyes, an I.C.I. discovery of world-wide importance, offer decisive advantages. Their brilliant range of colours would alone put them ahead. But even more important, they are almost completely unaffected by soap and detergents when washing. The reason? Because they actually *combine chemically* with the fabric, whether cotton, rayon, silk or synthetic.

'PROCION' dyes are one of the most notable discoveries of I.C.I. since we came into existence just over thirty years ago. In their own field they rank with hormone weedkillers and benzene hexachloride (BHC) as major contributions by our organic chemists to progress. There is no doubt that they will add substantially to the Company's prosperity and make the lives of millions of people more attractive.

Before I explain what 'Procion' dyes are, let me say briefly what they will do that other dyes have not done before them.

Firstly, because of 'Procion' dyes it is possible to buy cottons, rayons, silks and nylons in brighter and faster colours than ever before. Secondly, the 'Procion'-dyed or 'Procion'-printed materials will stand up to repeated washing with soap and detergents. Even if you were so vigorous with your washing that you managed to detach a little of the chemically held dyestuffs from the fabric and so get a coloured solution it is most unlikely that this colour would re-attach itself to any of the other goods in the wash. 'Procion'-dyed goods do not mark or rub off on to adjacent white or coloured cloth; and lastly, should you prefer your 'Procion'-coloured covers, curtains and dresses to be dry-cleaned you will have no trouble, as they are highly resistant to chemical solvents.

These advantages have not been gained at the expense of technical merit. Increased experience with 'Procion' dyes in dyeworks and print shops throughout the world re-emphasises the first laboratory observations that 'Procion' dyes colour the cloth in as even and level a manner as the very best of the traditional dyes. This has encouraged dyers and printers to experiment with and adopt 'Procion' dyes, and their regular use has now spread to more than fifty countries of the world. It is, however, so early in the history of their industrial application that their full advantages have probably not yet been completely appreciated.

Before we consider what 'Procion' dyes are, let us take a brief glance at the story of dyeing.

When, in his early history, man had a little time to spare from providing food and clothing for himself and his family and repulsing his animal and human enemies, he turned his attention to some practical form of artistic expression. This quickly involved him in using coloured materials. He discovered that skins, leather and cloth could be coloured by using solutions and extracts of vegetable and animal materials.

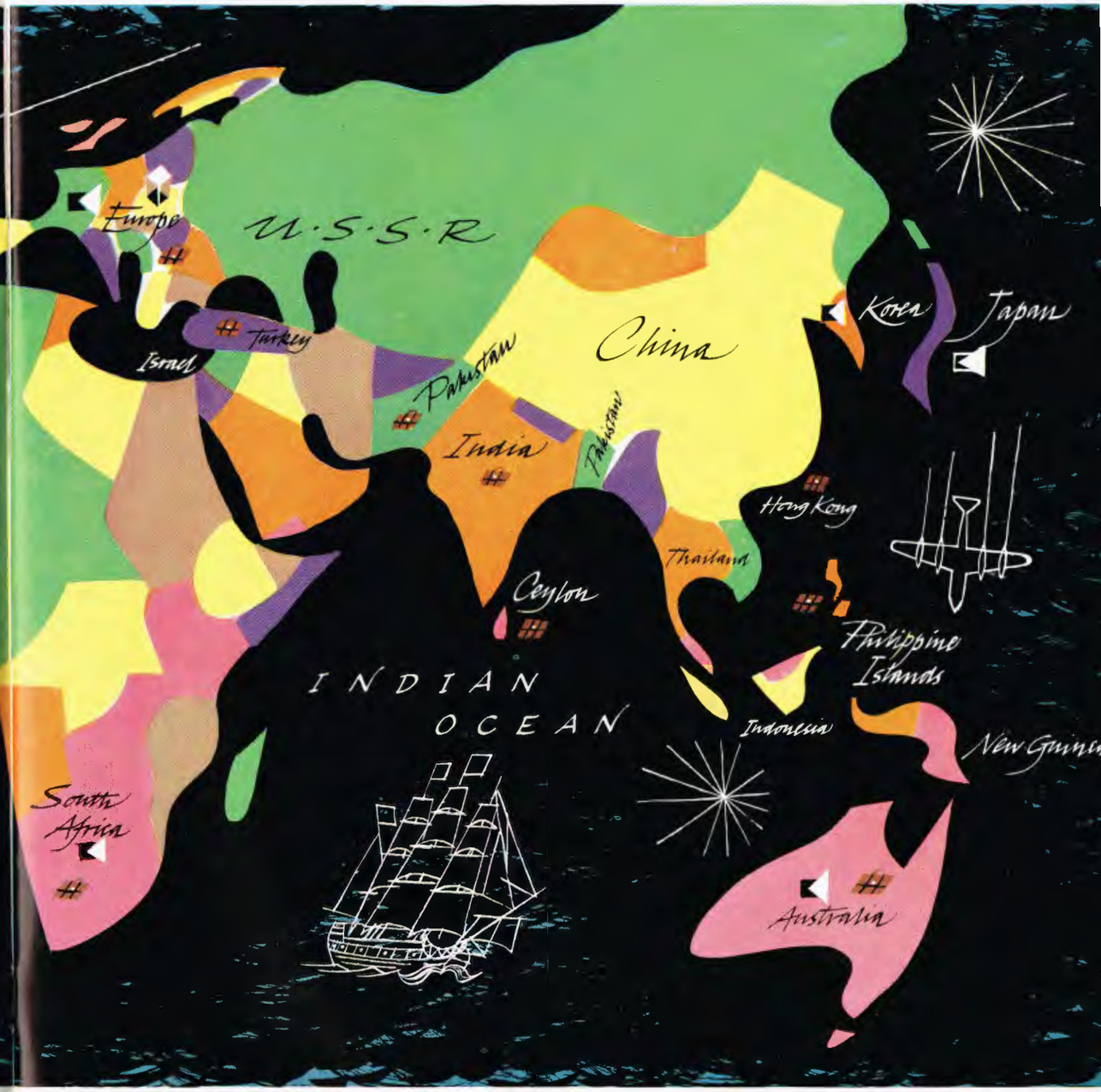
Modern industry calls this process "dyeing" and calls the coloured products employed in the process "dyes" or "dyestuffs." The simplest modern dyeing process involves dissolving a dyestuff (usually a special organic chemical) in water, soaking the textile or leather in this, and allowing the dye to be absorbed from the water by the textile or leather.

A serious disadvantage of this method of dyeing shows itself to housewives when soap or detergents remove the dye from the coloured material to redeposit it in a haphazard and unattractive way on other goods or garments. Dyemakers, dyers and printers have researched continuously to overcome this drawback.

One improvement has been to imitate the process by which natural indigo used to be applied to wool and cotton. This is the so-called vat process. During the twentieth century notable new dyestuffs of the vat class have been invented in Germany, Switzerland and Britain, so that it has been possible over the past years to establish a gamut of colours of high fastness to washing and to light, particularly on cotton cloths. The vat dyes are not much affected by washing because they are insoluble in soapy water. They seem to become embedded in the fibre like very small currants in a long thin bun, and part of the skill in dyeing vat dyes effectively is to get the right size of currant. If it is too small the best resistance to hot soapy water will not be obtained, and if it is too large

Fabrics dyed with 'Procions'

THE WORLD-WIDE INTRODUCTION OF 'PROCION' DYES



Overseas Visits by Dyestuffs Division Senior Technologists

(*a*) Austria	4 visits	Italy	3 visits	Hong Kong	5 visits	(*i*) Chile	3 visits
Belgium	3 ,,	(*e*) Norway	2 ,,	India	3 ,,	Colombia	3 ,,
Czechoslovakia	1 ,,	Poland	1 ,,	Indonesia	1 ,,	Ecuador	1 ,,
Denmark	3 ,,	Portugal	2 ,,	Israel	1 ,,	Peru	2 ,,
Eire	2 ,,	(*a*) Sweden	6 ,,	(*h*) Japan	4 ,,	Uruguay	3 ,,
Finland	3 ,,	(*a*), (*f*) Switzerland	7 ,,	(*i*) Korea	1 ,,	Venezuela	1 ,,
(*a*) France	5 ,,	Yugoslavia	1 ,,	(*i*) Mexico	4 ,,	Thailand	2 ,,
(*b*), (*c*) Germany (West)	8 ,,	South Africa	2 ,,	Pakistan	2 ,,	Turkey	3 ,,
(*d*) Germany (East)	2 ,,	Australia & N.Z.	2 ,,	Philippines	4 ,,	(*j*) U.S.A.	4 ,,
Greece	1 ,,	(*g*) Canada	3 ,,	Argentine	3 ,,		
(*a*) Holland	7 ,,	Ceylon	1 ,,	(*i*) Brazil	3 ,,		

NOTES

(*a*) In the initial stages of developing 'Procion' dyestuffs an ambitious scheme was launched whereby senior technologists visited these markets and gave lectures and practical demonstrations to invited audiences gathered from all the leading potential users of 'Procion' dyes. After the lectures and discussion, the team of visiting lecturers split up and paid visits to individual firms' plants to carry out bulk scale demonstrations and trials. In Sweden, Scandinavian countries were brought together for the first time to discuss textile dyeing and printing. The meeting was held at Gothenburg and was attended by dyers and printers from Norway, Sweden, Finland and Denmark.

(*b*) Includes attendances at the Leipzig Fair in 1957 and 1958.

(*c*) Includes a lecture by the Chief Colourist, Dr. T. Vickerstaff, to the Verein der Textilchemiker und Coloristen.

(*d*) Includes a lecture to the Chamber of Technology, Karl Marxstadt.

(*e*) Includes a lecture to the Norwegian Textile Society.

(*f*) Includes a lecture by the Chief Colourist to Schweizerischer Verein der Chemiker-Coloristen.

(*g*) Includes a lecture to the Canadian Association of Textile Chemists and Colourists.

(*h*) Lectures given and customers' works visited.

(*i*) Includes lectures to textile technologists.

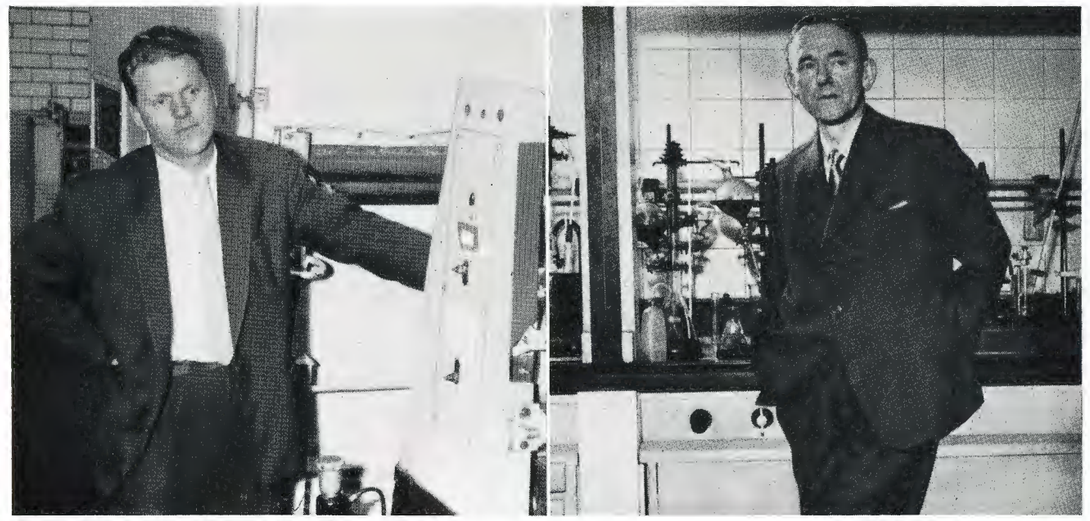
(*j*) Includes a lecture by the Chief Colourist to the Gordon Research Conference.

EXHIBITIONS

VISITS

LECTURES

Fabrics printed with 'Procions'



Mr. I. D. Rattee and Dr. W. E. Stephen, the joint discoverers of 'Procion' dyes in the Dyestuffs Division Research Laboratories

the coloured yarns and fabrics will be less resistant to wet and dry rubbing.

Unfortunately the range of vat dyestuffs is weak in bright colours, being devoid of yellows, reds, scarlets, turquoise and bright blues of high fastness. Moreover, the application of vat dyes needs careful supervision if the job is to be of top quality. This makes the dyeing and printing processes expensive. Another limitation is that vat dyes are not generally suitable for colouring fibres and fabrics other than cotton and rayon.

Because of these difficulties research continued, but always employing traditional dyeing techniques not very different from those of our ancestors, until the 'Procion' discovery was made.

Now, 'Procion' dyes are different from all previous types of natural and synthetic dyes. They are "reactive" dyes, and show this reactivity *after* they have been absorbed into cotton, viscose rayon, silk, wool or nylon. The reactivity manifests itself when the coloured yarn in the course of dyeing is treated with alkali, whereby the dye molecule appears to combine *chemically* with the fibre. Most 'Procion' dyes are made by reacting a simple coloured molecule with one of the reactive chlorine groups in the chemical known as cyanuric chloride, and this reaction is conducted in such a way that at least one and often two of the other chlorine atoms in the cyanuric chloride remain free.

How did this discovery come about, and how was it developed to practical use? As far as the 'Procions' are concerned, the old indictment that Britain is slow to develop new scientific ideas does not apply in the least. In fact, the development went ahead so quickly after the initial discovery that quantities were available to dyers and printers in Britain in April 1956, months *before* the patents had been finally granted. Later in that same year, with increased manufacturing capacity, an active commercial campaign was extended to the countries of Western Europe, with powerful support from a strong technical service team. During the past two years more than 30 specialists in 'Procion' dyeing and printing have visited 17 countries in Europe and 25 countries in the rest of the world on, altogether, more than 120 occasions. These visits ranged from a few hours' discussion at one end of the scale to a technical demonstration extending for three months at the other.

The actual story of the work and thought leading to the 'Procion' discovery is a fascinating one. It began many years ago in the minds of dye chemists, who surmised that to react a dye with the fibre would be the golden road to fast coloured materials.

About the time of the outbreak of World War II, certain dyes for wool were observed to have unusual fastness properties. The late Mr. Baddiley, who was then Research Director at Blackley, was always puzzled by those results and referred to them frequently as worthy of attention right up to the time of his

(*Continued on page* 349)

People and events . . .

Chairman to visit India

SIR Alexander Fleck is to accompany the Duke of Edinburgh when he visits India and Pakistan early next year, it was announced from Buckingham Palace last month. As a past president of the British Association for the Advancement of Science, the Duke of Edinburgh has accepted invitations to represent the Association at the annual meetings of the Indian Science Congress at Delhi at the end of January, and the Pakistan Association for the Advancement of Science at Karachi early in February. He will also tour centres of scientific and industrial interest in both countries.

The Duke of Edinburgh has invited Sir Alexander, the current president of the British Association, to accompany him throughout these two visits.

First Again

THE news that Metals Division is to build Europe's first wrought beryllium plant received wide publicity in the press last month. The plant, which will produce beryllium rod, tube and plate and finished machined parts, will come into operation at the end of next year. Its first task will be to fulfil a production scale contract placed with I.C.I. by the Atomic Energy Authority. Subsequent spare capacity may find additional outlets for this unusual metal, as for example in the aircraft industry.

* * *

Beryllium is the third of the "new" metals to go into commercial production in I.C.I. Titanium came first in 1955, and capacity now stands at 2000 tons a year. Zirconium production reached commercial proportions earlier this year; almost all output goes to the U.K.A.E.A.

Although it may eventually find other outlets, beryllium is essentially a "nuclear" metal. Particularly important is the fact that it combines the lowest possible rate of neutron absorption with an ability to withstand high temperatures. This is a vital point, because reactors of the Calder Hall type can only be made more efficient (and so, it is hoped, produce cheaper power) by being "hotted up."

That is why beryllium has been chosen for fuel cans in the most advanced reactor yet designed for the U.K.A.E.A. and why, in spite of many technical problems and the need for specialised and costly equipment, Metals Division has added yet another important metal to its production range.

The beryllium announcement well to the fore on the Metals Division's stand at the Geneva "Atoms for Peace" Exhibition last month

Colour Film Link-up

I.C.I. and Ilford, Britain's largest photographic equipment makers, are to join forces in the technical and commercial development of colour film. I.C.I. is financing the new venture—over the next five years the Company will acquire a one-third interest in Ilford's by buying nearly £5 million of new Ilford Ordinary shares. Ilford, in return for a royalty, are acquiring I.C.I.'s new colour film process 'Icicolor' and will make and market the film. I.C.I. is also entering into a long-term agreement to continue research on behalf of Ilford.

'Icicolor' is a Dyestuffs Division development. The Division started researching on colour film more or less from scratch ten years ago because of their interest in colour formers. The film they have developed is a negative-positive system like Kodacolor and Agfacolor, where, as in black and white photography, you first get a negative from which any number of prints can be produced.

Manufacture of the film was begun, on a limited scale for professionals only, at Burn Hall Works, an old agency factory near Fleetwood, at the end of 1956.

* * *

As we go to press, little can be added to the reports which have appeared in the national press. Meetings are at present in progress at Manchester between technical experts from Ilford and our own research people. Burn Hall is continuing production of 'Icicolor' for the present, and it seems likely that Ilford will aim to introduce the new film on to the market next summer.

Oldest of them All

I.C.I.'s oldest employee retires on 3rd October, when he reaches the age of 75 after completing over 60 years' service with the Company. He is Mr. Jack Webb, a boilermaker at Alkali Division's Wallerscote Works.

He started work with Brunner, Mond & Co. in 1898 as a rivet boy and served his apprenticeship as a boilermaker. During the first world war he worked at the Gadbrook TNT factory, which was operated by Brunner-Mond for the Ministry of Supply. Later he was transferred from Winnington to the Wallerscote site, where the new works were then under construction, and he has remained at Wallerscote ever since.

Mr. Jack Webb

Jack Webb's absorbing interest outside work has been association football. As a young man he played as semi-professional for several Cheshire League teams. When the I.C.I. (Alkali) Football Club was formed in 1928, Jack was invited "to come and teach these boys how to play football." This he did, and the club's formidable list of successes is in no small measure due to Jack's help as trainer. Throughout his association with the club he can recall missing only one match. In keeping the team untroubled by injuries he has even gone to the extent of preparing his own embrocation and ointments, but wild horses wouldn't drag from him the secrets of his preparations.

TV Panellist

A LAB ASSISTANT from Salt Division, 20-year-old Robert Minshull, was a panellist recently on Granada TV's programme "We Want an Answer." The topic originally chosen was amateur *v.* professional status in sport, and the guest invited to act as an Aunt Sally for the panel was Chris Brasher, former Olympic gold medallist and now the *Observer* sports editor. Two days before the broadcast, however, Mr. Brasher had an accident while in Stockholm for the European Games, so a completely new programme on the Lambeth Conference report was at the last minute substituted with the Bishop of Carlisle answering questions fired at him by the panel ranging from the H-bomb and birth control to gambling.

Mr. Brasher's accident was not the only hitch. An electricians' strike at the Manchester studios added to the crisis, and emergency plans for flying the panel members down to London and transmitting the programme from there were hurriedly put in hand. But all went well in the end, and Bob Minshull's only regret at the end of the evening was that the strike ended in time to make the flight unnecessary.

Bob Minshull was chosen by Granada producer Michael Scott from eight I.C.I. lab assistants and apprentices drawn from the Alkali, Salt, Dyestuffs and Leathercloth Divisions. The other five panel members came from Lancashire youth clubs and the Manchester police cadets.

The End of Roslin

NOBEL Division's association with historic Roslin Mills, where gunpowder was produced for over a century and a half, ended on 29th July,

(*Continued on page* 334)

NEWS IN BRIEF

For Nuclear Power Stations. Nearly 400 miles of a special form of 'Integron' heat exchanger tubing, specially developed by Metals Division for nuclear engineering, is being used in the heat exchangers of the new nuclear power stations at Berkeley and Bradwell. Samples of this tubing were among the exhibits shown on the I.C.I. stand at the Atoms for Peace Exhibition in Geneva last month.

Australian 'Visqueen.' Extensions at the I.C.I.A.N.Z. polythene film plant at Deer Park, Victoria, announced in August will raise capacity by 50%. Outlay on the extensions will be nearly £300,000.

Design Award. A certificate has been awarded by the Council of Industrial Design for 'Rexine,' 'Vynide' and 'Vynair' patterns displayed at the Brussels Exhibition.

New Ardeer Plant. After close on 40 years No. 1 Hill nitroglycerine batch plant at Ardeer Factory is being replaced by a new Swedish-designed plant. The new nitroglycerine plant is expected to come into operation early next year.

Stopping the Sprout. A new product —I.C.I. Nonanol Sprout Depressant— is now available to farmers for use on potatoes stored indoors. The nonanol treatment ensures that the potatoes are free from sprouts no matter how long they have been stored and will make possible the extension of the period when late-stored potatoes are in demand, especially by fryers and processors.

Irish Sea Rescue. The *Lady Anstruther* (Nobel Division) on a recent trip to Milford Haven answered a distress signal fired over the Irish Sea. A pleasure craft making her way from North Wales to Dublin had gone adrift for three days following engine trouble. Acting Master A. McGregor took the two-man crew on board and later landed them at Milford Haven.

Championships at Billingham. The British Amateur Gymnastic Association's annual championships are to be staged next year at the Billingham Synthonia Club.

In the Money. Last month cheques totalling £375 were distributed to 42 of Nobel Division's Research Department students who attained first-class passes in their examinations. The presentations were made by Dr. David Traill, Division Research Director.

Green Fingers at Northwich. Winnington Works gardeners, exhibiting at the Shrewsbury Flower Show, won the coveted Viscountess Boyne Trophy and first prize with a group of begonias, a further first prize for fuchsias, and a second prize with a display of coleus.

when the two 100 ft. high chimneys on the site were demolished by explosives. Roslin, which started up in 1790, was I.C.I.'s oldest factory. Gunpowder was made there for Waterloo. It was closed down three years ago, when it was no longer possible to stave off subsidence caused by coal mining which had been undermining the factory buildings for some years. The site was acquired by the Forestry Commission and the National Coal Board, who recently invited the Division to undertake the sad task of removing the chimneys—the last trace of Roslin's identity as a powder mill—as they had become dangerous.

The demolition was carried out by **Mr. Matt Ferguson** (Technical Service Department), and he was assisted by **Mr. Tom Meldrum** (Edinburgh Area Sales Office) and Mr. Geoffrey Perks and Mr. Godfrey Azzopardi, a Maltese Government official, both in the Division on instruction courses.

Return Fare

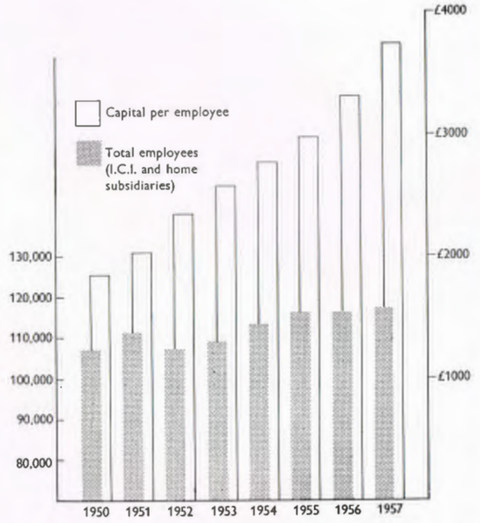
KIPLING'S Gunga Din would have been amazed at the development of Marston Excelsior's new 'Portolite' tanks, but his skin water bottle and the goat and sheepskin bottles carried by

thousands of his forebears, some of which carried more interesting liquids, are really the ancestors of 'Portolite' tanks.

The tanks are simple lightweight flexible containers like a vast sausage skin specially designed for bulk transport and storage of liquids. They are made from specially selected elastomers reinforced with 'Terylene' and other synthetic fibres.

There are many hundred thousands of special tanker vehicles on the railways, roads and waterways of the world, a large proportion of which are empty making their return journeys. This obviously makes them an expensive proposition, quite apart from their very high initial cost. In a great many cases the liquids, which at present are being conveyed by these expensive methods, could be carried by ordinary transport using 'Portolite' tanks, which when emptied are rolled up into a small bundle allowing full load space for other cargo on the return trip.

Capital and Employees



This diagram shows the capital invested by I.C.I. in plant, offices, vehicles and other equipment per employee in the U.K. It will be seen that this has doubled in the eight years since the revaluation of the Company's assets in January 1950.

"Endeavour" Prizewinners

THE first prize in this year's *Endeavour* Essay Competition has been awarded to an 18-year-old Winchester College boy, Charles Perrin, for his essay on "Darwinism Today." He received his prizewinner's certificate from Sir Alexander Fleck on 29th August during the British Association's annual meeting at Glasgow.

Mr. Perrin is the youngest winner of the senior prize since the competition was started in 1950. He is the son of Mr. M. W. Perrin, chairman of the Wellcome Foundation, who before the war was a member of the Alkali Division Research Department and during the war, as assistant director of Tube Alloys, was closely associated with Sir Wallace Akers in atomic research.

This year 92 entries were received for the competition; this is 19 more than last year. Although many were from abroad, this time all the prizewinners came from Great Britain. The second prize went to a student at Newnham College, Cambridge, Miss Angela Glynn, and the third prize to Mr. John Horrocks of the Bradford Institute of Technology. The two five-guinea prizes in the Junior Section were awarded to Anthony Orchard of Swansea and Andrew Billson of Nottingham.

Old-established Agents—5

MR. Billy Doel, I.C.I.'s Panama agent, has been selling anything from boot polishes to soda ash in Central America for 35 years.

His first job was with Gossages of Widnes, and his duties included pushing the sale of their soap, boot polish and perfumery products in Central America and the "top half" of South America. Selling soap was easy enough, he recalls, but the rest was uphill work, and a second call on a perfumery customer in particular was not always a pleasant one.

In 1929 Gossages joined Lever Brothers and Crosfields in forming United Exporters Ltd., and shortly afterwards Billy Doel left to form his

own business in Panama. A temporary arrangement with I.C.I. to sell our products in Panama on a commission basis led to the signing in August 1934 of the heavy chemicals agency agreement between Doel and I.C.I. which continues today.

Business has since steadily increased, and Agencias W. H. Doel have outgrown their Panama City premises no fewer than three times. The latest move to Avenida National, known unofficially as "Automobile Row," took place in 1956. Within the last few years the agency has also taken on the handling of Plastics, Metals and Paints Divisions' products.

"Safety Week" Down Under

DEER PARK Safety Week was a "must" for the Governor of Victoria, General Sir Dallas Brooks. That is what he told 2000 I.C.I.A.N.Z. employees at the official opening. The Governor was speaking from the Deer Park Recreation Club after a whirlwind 60-minute tour of the Nobel Works, where he took part in a gas rescue demonstration and toured the synthetic ammonia and explosives areas, including the Biazzi plant.

Five factories in the Deer Park area (Nobel, Fabrics, Ammunition, Urea Formaldehyde and Ammonium Sulphate) took part in the Week. A packed programme for 2000 employees and their families included safety displays and refresher safety courses, "open nights," and a closely contested Safety Quiz with the first prize a £A210 television receiver.

I.C.I.A.N.Z. has now reduced its rate for lost time accidents from 9·4 per 100,000 man-hours in 1946 to 1·9 in 1957. This year's target of 1·5 should be achieved on present indications.

The Name's the Same

WHAT'S in a name? Quite a lot, apparently, if your name is Caress and you happen to visit Japan. **Dr. A. Caress**, Fibres Division chairman, returned recently from a round-the-world trip which took him to Japan to visit the new factories of I.C.I.'s 'Terylene' licensees there, the Toyo Rayon Co. and Teikoku Rayon Co., where they are making polyester fibre under the name 'Tetoron.' The Japanese were much intrigued that Caress in Japanese means a crow, so as a memento of the visit Mr. Ohya, president of Teikoku, presented Dr. Caress with a wood carving of that bird.

From Japan Dr. Caress went on to spend two weeks in Australia and New Zealand, I.C.I.'s biggest export market for 'Terylene.'

Our picture, taken by a Canadian Pacific Airlines photographer, shows Dr. Caress with **Dr. R. R. Lyne** (assistant manager of Fibres Division Techno-Commercial Department), who was with him on the tour, on the last leg of their homeward journey.

Dr. R. R. Lyne (left) and Dr. A. Caress at Vancouver

A Much-travelled Drum

"IT'S a mystery to me. The last I saw of it was in Cairo in 1919, when I handed it in before coming home for my demob," said **Mr. J. Harvey** (Head Office Despatch Department). He was referring to the drum which he carried with him when serving in Greece, Palestine and Egypt during the 1914–18 war and which recently came to light at the Vancouver headquarters of a Canadian militia regiment.

The commanding officer found the old drum in a showcase and presented it to the regiment's pipe band. The bandsman in charge of the drums, a Mr. MacLeod, decided it could do with a new coat of paint. When he took it to pieces, he found written inside the shell: "This drum was carried by Private J. Harvey with the Egyptian Expeditionary Force, 9/10 Middlesex D.C.O. 1916–19."

Mr. J. Harvey

Then followed a detailed description of the engagements in which Private Harvey saw action, and a note to the effect that he had left the service and was living at 16 Selwyn Road, Harlesden, London.

Curious to know how the drum had found its way not only to Canada but to Vancouver over on the Pacific coast, Mr. MacLeod took a long chance and wrote to the Selwyn Road address. Mr. Harvey moved from there many years ago, but the letter eventually caught up with him at his home in Wembley. But he cannot supply the answer to Mr. MacLeod. His biographer and the drum's history from Cairo to Vancouver remain a mystery.

Club for Ex-athletes

ONE of the presiding geniuses behind the Amateur Athletic Association's Honorary Members Club which was launched at the White City last week during the Britain *v.* Finland meeting is Mr. Harry Whittle (Central Work Study Department), who captained the British team for the Helsinki Olympics in 1952.

Mr. Whittle is temporary secretary of the new club. At the moment the club has not been given a name. The best suggestion so far, he tells us, is the "Alpha Club." He and his committee hope to attract as members many ex-athletes like themselves who although retired from first-class athletics still retain a keen interest in the sport, and who as a body will assist the A.A.A. in its work of piloting Britain's newest national sport. Members include Chris Chataway, Roger Bannister, Don Finlay, Godfrey Brown and Squire Yarrow. The chairman is the new Commissioner of the Metropolitan Police, Mr. J. Simpson, who is himself a former international hurdler.

PEOPLE

Sir Alexander Fleck has been elected an Honorary Fellow of the Royal Faculty of Physicians and Surgeons of Glasgow.

Among 800 singers from all over Britain who took part in the triennial festival of the Royal School of Music held recently at the Albert Hall was **Miss Olive Sleaford** of Nobel Division's Westfalite Factory. Queen Elizabeth, the Queen Mother, attended the festival.

A business computer symposium to be held concurrently with the Electronic Computer Exhibition at Olympia in December will be under the chairmanship of the **Earl of Courtown** (head of Office Administration Department). The opening address will be given by the Earl of Halsbury.

Mr. W. Marshall Clark has been appointed a director of African Explosives and Chemical Industries Ltd. He is also a director and manager of the Anglo-American Corporation of South Africa Ltd.

Among those taking part in a recent broadcast of the B.B.C.'s "Down Your Way" programme featuring Brixham in Devon was **Dr. P. N. J. Chipperfield,** group head of Paints Division's Marine Research Station.

Both prizes in Stevenston's gardens competition have been won by the McCann family. One prize was won by Mrs. McCann, who was aided by her son, **Mr. Alexander McCann** (Ardeer Research Department), and her three daughters, **Anne, Cissie and Mary McCann,** who also work for Nobel Division. The other prize went to her other son, **Mr. Bernard McCann,** an explosives van driver.

Mr. Keith McLaren (Dyestuffs Division Dyehouse Department) has been awarded the Research Medal of the Worshipful Company of Dyers for a series of papers on light-fastness testing and the fading of dyes.

Mr. Morlais Thomas, a furnaceman in the Hot Mill at Waunarlwydd and a keen student of industrial relations, recently won a fortnight's scholarship to Geneva. The course he attended was organised by the W.E.A. and the Workers' Educational Trade Union Committee in conjunction with the International Labour Office.

A full-size sailing dinghy designed and built by **Mr. R. A. Tregilgas** (Paper Goods Manufacturing Co.) was judged the best exhibit in this year's Lawson Memorial Fund Exhibition, attracting nearly 60% of the votes.

The four-man steering committee set up to bear responsibility for the research programme of the new D.S.I.R. Warren Spring Laboratory at Stevenage includes one of I.C.I.'s deputy chairmen, **Dr. R. Holroyd.**

A Dyestuffs Division first year apprentice, **Norman Brown,** came second when he took part in the long jump in the Scottish junior amateur athletics competition with a jump of 19 ft. 6 in., beating the previous Scottish junior record by 7½ in.

Miss Patricia Sharratt, secretary to the Electrical Services Manager and the Establishment Officer at Kynoch Works, is the first Metals Division employee to attain the Private Secretary's Diploma issued by the London Chamber of Commerce. Only 59 in all England won the diploma this year.

Two Wilton apprentices—**C. Watson,** an apprentice sheet metal worker, and **B. E. Turner,** a student apprentice—were chosen to go on a fortnight's industrial study tour in Western Germany in August organised by the Economic League (North-east Coast area).

Mr. A. R. Allardyce, Billingham Ammonia Works Councillor, has been co-opted as a member of the Board of Governors of the Stockton-Billingham Technical College.

'Visqueen' Snowbound

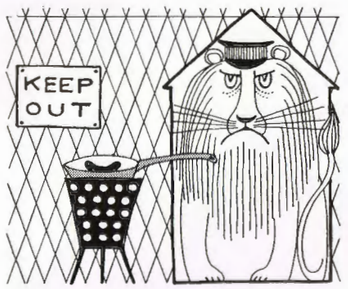
IN Brisbane, Australia, a team of workmen are planning for snow. Not that they are at all likely to see any in their own home town. These men are prefabricating a complete satellite town to be built a thousand miles away 4000 ft. above sea level in the heart of the Australian Alps. The town will house workers on Australia's giant Snowy River irrigation and hydro-electric power scheme.

One of the obvious problems of building a town above the snow line is how to keep warm. Here I.C.I.A.N.Z.-produced 'Visqueen' polythene film is playing its part. Nearly 300,000 sq. ft. of the film is being used as insulating material in the prefabricated "sandwich" walls which have been adopted for many of the buildings.

Mr. John Booker, head of the firm of designers and contractors who are building the town, is enthusiastic about the effect of the 'Visqueen' film. During a record cold spell, with temperatures 30 degrees below freezing, 'Visqueen'-insulated buildings on the site were 15 degrees warmer than similar untreated buildings, he said.

Redundancy

A WORK study story with a difference has cropped up in a monthly progress report on A.E. & C.I.'s new Dar-es-Salaam explosives magazine. The report is concerned among other matters with a request from the local police that the watchmen there should be provided with greater protection



against stray lions, and refers to enquiries afoot for providing the whole magazine area with an animal-proof fence.

The writer concludes: "If they (the lions) really are such a menace, perhaps they would offer sufficient protection for the magazines and the watchmen might in fact be superfluous!"

New Nylon Factory

BRITISH Nylon Spinners Ltd., one of I.C.I.'s associated companies, is seeking permission from the Board of Trade to build a £10 million factory a few miles from Portsmouth. The factory is planned to cover over 100 acres and to employ about 2000 workers.

British Nylon Spinners, founded jointly by I.C.I. and Courtaulds in 1940, are the largest manufacturers of nylon yarn in the world outside America. The company has two factories in Britain—the original plant at Pontypool, where spinning began in 1948 and which now employs 5000 people, and the Doncaster factory opened in 1955 on the site of an old British Celanese factory, which has 2000 employees. Besides this, B.N.S.'s Australian subsidiary started production last January at their new £A4 million factory in the suburbs of Melbourne. The nylon polymer for these spinning plants comes from Billingham and Wilton.

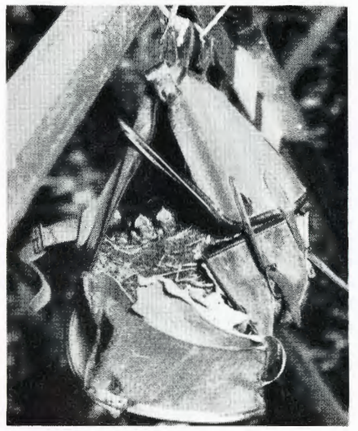
Youngest Referee

EMPLOYEES at Nylon Works, Billingham, who want an authoritative opinion on their Monday morning soccer inquest go to **Mr. Kevin Howley,** a production clerk in the general services section there. Two years ago Mr. Howley was appointed a First Division referee, and now at 34 he has just become the youngest English referee on the International Football Association's list of international referees.

He began refereeing when serving as a seaman torpedoman in the Royal Navy and qualified as a first-class referee in 1948. It is our guess that Mr. Howley is unique among top flight referees, for he has never played football himself and, on his own admission, "couldn't kick a door if I was standing on the latch."

Squatters

THE wail of the works hooter sounded the end of another working day at Steatite, and **Mr. Alan Carter** made his way to the cycle racks. It was just



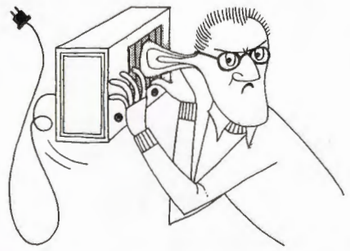
The Steatite robins

like the end of any other working day except that some practical joker had stuffed leaves and dried grass into his saddlebag. The same thing happened the next day and the next, and it turned out that a robin waited for the arrival of the bicycle every morning so that he could carry on the good work of building a nest.

Mr. Carter thoughtfully hung the saddlebag from a beam, and the robin and his mate promptly took possession. Six eggs were laid, all of which hatched out, and the saddlebag was eventually evacuated.

Quotes of the Month

"Your lessons are so lovely that I can't tear off my ear from the loudspeaker."—*Polish student referring to the B.B.C.'s "English by Radio" broadcast, reported in "The Times."*



"Hands off the moon! Why mutilate the only face that pleases all the human race?"—*A. P. Herbert in a letter to "The Times."*

NEW APPOINTMENTS

Some recent appointments in I.C.I. are: **Billingham Division:** Mr. M. D. Bone (Products Works Manager), Dr. R. A. Fairclough (Associate Research Manager), Mr. J. B. Gibson (Gas and Power Works Manager). **Head Office:** Mr. R. M. Govan (head of Far East Department), Mr. G. M. Storie (section head (Overseas Pensions) in the Pensions Department), Dr. A. G. Winn (Personal Assistant to Mr. W. D. Scott). **I.C.I. (Japan):** Mr. T. M. Milne (President). **Magadi Soda Co.:** Mr. D. A .B. Garton-Sprenger (General Manager). **Plastics Division:** Mr. M. J. M. Clarke (Division Labour Manager).

OBITUARY

Captain A. Hayton Cowap

We regret to announce the death on 28th August of Captain A. Hayton Cowap, who at the time of his retirement in 1945 was a Billingham Division Director. He was 80. *Sir Ewart Smith writes:*

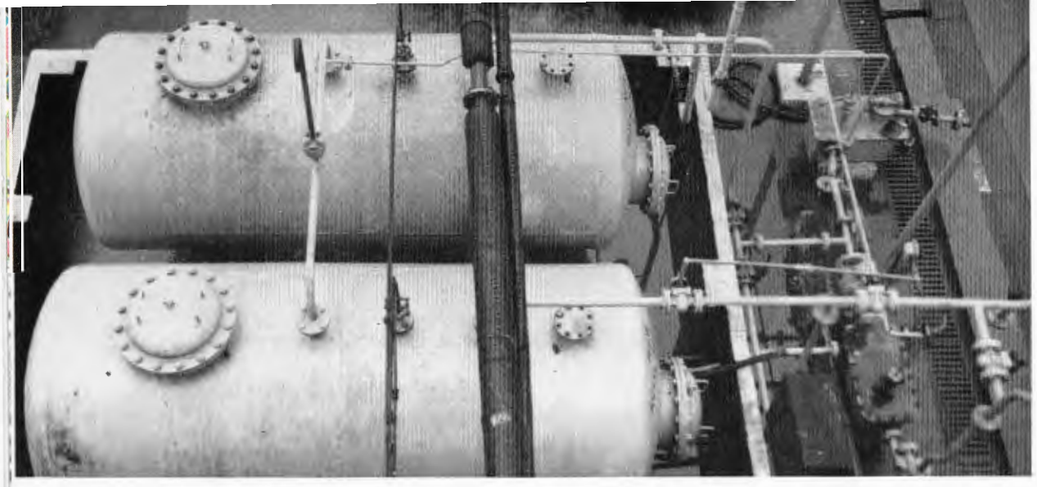
Captain Cowap—"Shack" to his many friends—was a notable engineer of the old school and an outstanding personality.

He entered the drawing office of Brunner, Mond & Co. in 1891 at the age of 13. After active service with the Cheshire Regiment he was appointed in 1920 to be Chief Engineer of the company's new synthetic ammonia factory, later to become the Billingham Works of I.C.I. Cowap's abounding energy, optimism and shrewd practical engineering knowledge were dominating factors in the struggle to develop a process based on difficult engineering and chemical techniques then quite novel in this country. The success of the venture and its growth within ten years to the largest chemical complex in the Commonwealth owed much to the character and team-building capacity of this remarkable man. As a director Cowap continued for many years to guide Billingham's engineering activities in the role of elder statesman. In 1941, when due to retire, he organised the development and production of ammunition for special weapons, including the P.I.A.T., with all his old drive and enthusiasm.

Those of us who were privileged to serve under him in a professional capacity—and we numbered hundreds—will always remember his courage and integrity as well as his blunt good humour. His injunction, when difficulties arose, to "look on the bright side of the shield" was no empty phrase, and he was always our friend as well as our leader.

He was a large man in every sense, and his vision and practical grasp matched his physical size: whether at work or in relaxation he showed terrific enthusiasm in all he did. There are many who owe a great deal to his guidance and example. His country, too, has gained much from his work as one of the leaders in founding the far reaching nitrogen industry.

It was said of him that once met he was always remembered, that he was tough but never unkind, and that his proudest boast was that he was an Englishman.



Men with Ideas—9

Daniel Stobbs

I.C.I. was one of the first firms in Great Britain to make penicillin in commercial quantities. In the days just after the war it was an expensive rarity; today it is one of the cheaper drugs, thanks to improvements in the manufacturing process, and even now no improvement is too small to be considered.

Large quantities of expensive solvent are used in the making of penicillin. At the end of the run the solvent-bearing penicillin is displaced by water and the solvent recovered. Danny Stobbs, a chargehand process worker in Pharmaceuticals Division's penicillin plant at Trafford Park, detected a weak spot in this part of the process.

In a remote spot in the labyrinth of pipelines, dips were trapping some of the solvent. It could not be recovered, and although the amount was small the annual loss was considerable.

Danny considered the problem. He decided that new pipeline layouts would make it possible for the solvent, being lighter than water, to float out and be recovered. He submitted details through the Suggestion Scheme. It was a simple idea but effective, and Danny's award, calculated on the saving of solvent, was £40.

THE ELECTRON MICROSCOPE

By B. W. Morrish and N. D. P. Smith (Paints Division)

Illustration by H. J. Eric Smith

Without the electron microscope the immense advances made in recent years in the study of virus diseases would hardly have been possible, for the simple reason that with an optical microscope you just cannot see a virus. Under the old optical microscope using light, magnification is limited by the wavelength of light. Today a stream of electrons can replace the beam of light and magnetic fields can take the place of lenses. Magnification of over 50,000, thrown on a fluorescent screen as in television, is now possible.

"Yes, I have a pair of eyes," replied Sam, "and that's just it. If they wos a pair o' patent double million magnifyin' gas microscopes of h'extra power, p'raps I might be able to see through a flight o' stairs and a deal door; but bein' only eyes, you see, my wision's limited."—CHARLES DICKENS, *Pickwick Papers.*

SAM Weller's famous outburst in the trial of Bardell *vs.* Pickwick echoes some of the frustration felt by scientists when they had reached the limit of the optical microscope and wanted magnifications greater than 2000.

Working with light was the trouble; they had to find some other means of illuminating the specimen if they wanted finer detail because the extent to which the magnification can be increased is finally limited by the wavelength of the light used. Ultra-violet light seemed promising at first and was tried, but the advantage to be gained was limited; at certain wavelengths glass becomes opaque, and it became difficult to find a suitable material for lenses. Illuminating without light seems a bit of a misnomer, but it became a reality when a beam of electrons was used for the purpose in place of a ray of light.

That fundamental change in approach came in the early 1930s, when the German scientist Ruska published the work he had done on developing an electron microscope. His discoveries were a natural development from those of Busch, who in 1926 had shown the lens properties of magnetic coils, and of others who found that electrons in motion had wave-like properties, the wavelength being some 100,000 times smaller than that of light; the result was the first use of electrons in a microscope and the first working machine, produced in 1934.

From then on development went ahead in several countries—L. C. Martin of Imperial College, South Kensington, led the work done here—and by 1939 the firm of Siemens in Germany had produced the first commercial model. America too was well ahead with development, and the Radio Corporation of America supplied the American market with machines by the early 1940s. They sent us half a dozen under the Lend-Lease Act, which were used on research during the war. In the post-war years Germany has produced several new models, as has America; and the Dutch, the Japanese and others have also been active in development.

After the war many I.C.I. Divisions installed electron microscopes as they became available—Billingham, General Chemicals, Nobel and Paints Division were the first, and they have been followed by Alkali, Dyestuffs, Metals, and Plastics (who have two).

The optical microscope gives a magnification of about 2000, whereas the electron microscope gives a magnification of over 50,000: that was the measure of Ruska's discovery. At this magnification a human hair would appear about the size of a factory chimney—8 ft. in diameter. Imagine the Wimbledon championships being played with tennis balls about the size of a football pitch, or, if you are used to map-reading on a hike, think of the relationship between an Ordnance Survey map and the ground it represents. Those are magnifications of 50,000, and show just how infinitesimal a fraction of things can be examined with ease under the electron microscope.

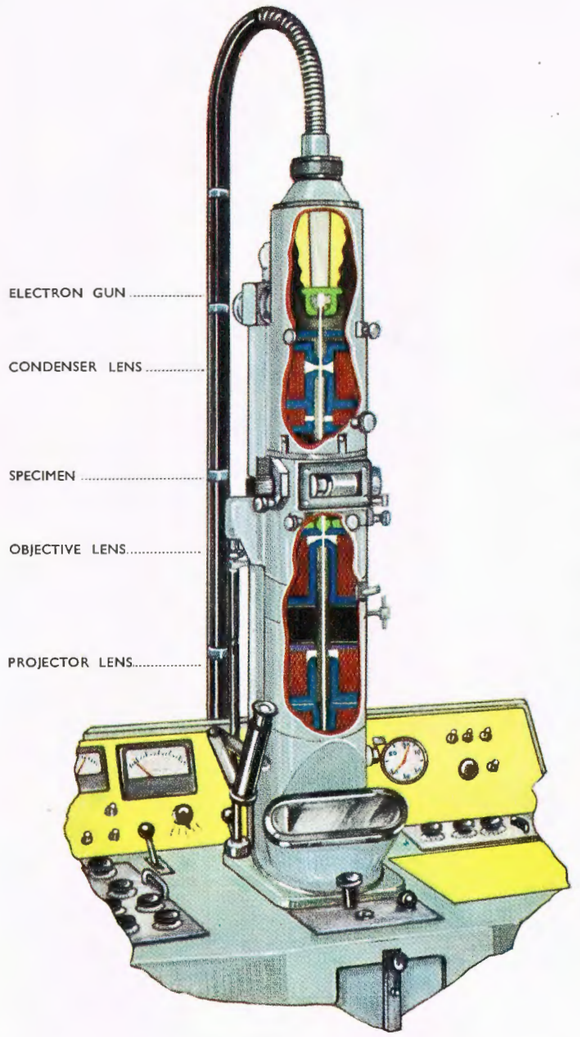
Most people have a good idea of how the optical microscope works—lenses giving an enlarged image, with light illuminating the slide—but the electron microscope sounds a bit more baffling. The system of working, strangely enough, is very much the same, even though the appearance of the two is rather different.

The main differences are that the specimen is "illuminated" by a beam of swiftly moving electrons instead of light, and the glass lenses—which obviously would not focus electrons—are replaced by specially shaped magnetic fields. The electrons replace the light, and the magnetic fields, called magnetic electron lenses, act on the moving electrons in much the same way as the glass lenses act on light. Because the eye cannot see the enlarged image it is thrown on to a fluorescent screen, similar to that in your TV set; it can then be viewed by the operator or photographed by a camera installed in the machine.

Each Division naturally uses its electron microscope for its own particular problems, but perhaps Paints Division's experience will give you some idea of its possibilities. The electron microscope is used in many ways, in conjunction with other research equipment, both on the development of paints and examination of paint films. It played its part in the development of our popular 'Dulux' Gloss Paint, ensuring that it had a lasting gloss.

That might not seem, at first sight, to be very difficult to achieve, but there were snags to be overcome. Some of the pigments used in paint have strangely shaped particles, of gritty appearance and with sharp edges; although the particles cannot be seen individually with the naked eye, a cluster of them may cause minute irregularities in a finish. They might be sufficient to break up the reflecting surface and cause poor gloss. As well as that, the shape and size of the pigment particles and the efficiency with which they have been mixed into the paint also have an influence on getting an even, uniform colour and the ease with which the paint is brushed on. So a close study of pigments is necessary for good paint manufacture, and the electron microscope has proved invaluable for the purpose. It has also been used extensively in the development of 'Du-lite' Emulsion Paint.

Some people, too, like to blame the paint when it starts to fail, whereas all too often the fault lies in the preparation of the surface to be painted. Paints Division has used its electron microscope on many types of paint failure, and in a number of cases it has helped immeasurably in finding where the fault lay. This, of course, is not the only occasion when a microscope has been called on for detective work, but its importance in establishing guilt is as well appreciated at Slough as it is at Scotland Yard!



A film of zinc oxide *as it looks under the electron microscope when magnified* 5000 *times*

Playing at Trains

By D. S. Clibborn

Colour photographs by Gordon Borthwick

Model trains and track have an ageless fascination for some people—from boyhood to the grave. But few enthusiasts show the persistence of D. S. Clibborn, who began building his railway and its locomotives twenty years ago. This year for the first time all the bits and pieces have been put together—and they work!

An understanding grin spread over the faces of all the family when, listening to "The Archers" on 27th December last, the dialogue between Phil and Jill took the following turn:

PHIL: *Had my eye on that electric train of young Tony's. I'd like half an hour with that.*

JILL: *Well, if he's gone to bed it'll be all the easier—you'll be able to have it all to yourself. Now if I'd only known I'd have bought you an electric train instead of the electric razor—I just had the idea you'd grown out of the model train age.*

PHIL: *Don't be silly—a man never grows out of model trains. Can't think why people imagine they're toys for children. Much more sensible to give 'em to grown-ups. Bet old Jack's having his money's worth out of it, you mark my words.*

It began for me twenty years ago with several visits to the 1938 Empire Exhibition in Glasgow, where at the Railways Pavilion—a joint effort by the four main railway companies of the day—there was a large gauge 0 layout. Not long before, as comparatively newlyweds, we had set up house at the coast with a large attic suitably floored. Earlier I had been skipper of a B.B. company in Glasgow, and to interest the lads during the summer months the drill hall was used for games and also for the laying out of a very simple model railway system.

This was my introduction to the game. And I took there and then the decision to develop a simple railway layout in gauge 0 for clockwork and steam traction, leaving scope for further enlargement and electrification. Had I known then that from 1938 till 1958 we should be domiciled in three other houses in turn—each with its quota of "do it yourself" jobs to be undertaken—not to mention an interim spell in a furnished house, and also that I should sample the hospitality of landladies in three different digs, it is possible that the decision might have been different.

From 1940 till mid-1945 there came all but one of the succession of changes of address, arising in some part from the war need to build and maintain agency factories in sundry widely spread localities. It was during this epoch that I constructed a form of portable workbench which, folded and stuffed with an electric

The author *at work on the lathe, preparing for the machining of locomotive wheels*

hand drill, soldering iron, small vice, adjustable lamp, and a motley collection of hand tools and items of "work in progress," looked, with its handles at both ends, like an elongated toolbox—which indeed it was.

Landladies were tolerant and understanding of the jobs then undertaken, including the construction of rolling stock and even additional six-foot lengths of track. Perhaps the fact that the tools were used on occasion for essential household repairs may have encouraged their tolerance, but their evident interest in the slow but sure assembly of vehicles or track was unfeigned.

Although by then (the end of 1943) we had perforce to give up our seaside house with its attic, the bug had bitten so deeply that any thought of giving up the hobby was just "out". My overall plan was to continue constructing rolling stock while at the same time pressing on with trackwork in sections for ultimate erection elsewhere. Electrification of the track began with the help of my family, which rapidly acquired an intelligent interest in Daddy's Railway.

The problem of how to turn to good account the persistent desire of my offspring to be allowed to help constrained me without consultation with work study officers to break tracklaying work into its elements, so that when the mood was on them the abounding

energy of the bairns could be diverted into useful channels. A series of timber and metal jigs were prepared by means of which my youngest daughter could from the age of four onwards hammer small steel sprigs part way into wooden sleepers, with her quota of sprigs kept on the end of a horseshoe magnet and a pair of pliers to extract from the sleepers those sprigs bent in the process.

With the jigs the two older boys could thread the alloy chairs on to three-foot lengths of steel rail, lay the sleepers in position on the baseboards against a chalked line and fix them down by banging home the already partly driven sprigs. Thereafter, with the establishment by the boss of a few datum points, they would complete a length of track as straight as you please—this to the self-confessed envy of some visitors whose own track, laid by platelayers of more mature years, had some of the much-publicised characteristics of Marilyn Monroe. Electrification proceeded with the aid of other gauges and devices which the boys also handled expertly, the art of soldering having no fears for them.

In the immediate post-war years there was still no prospect of having a permanent layout. However, on one bright occasion for three whole days parts of the layout were assembled at a local model engineering exhibition to enable some continuous running to be enjoyed and to test the accuracy of assembly of track units. But for the most part we had to be content with a portion of the high-level section laid along the side of a large room as a parking ground for rolling stock.

Eventually, with the last change of residence, I had a chance, early in 1954, to build a timber shed in the back garden so designed as to take a considerable part of the system on a weatherproofed outrigger shelf along one side. This left me space in the centre of the shed for a workbench, tools, control panels and the like.

Now, twenty years after plans were first laid, it is at long last possible to close a few switches and with reasonable certainty to expect action on the track to follow.

My railway, though occupying an area some 15 ft. by 27 ft., is, in comparison with the efforts of many other enthusiasts, a rather modest affair. Scenery as a feature is not yet greatly apparent and there are yawning gaps amidships which would horrify the purists; but with its two-level arrangement of retaining walls, bridges and inclines it should, before too great a lapse of time, present a reasonably complete picture. Like many another enthusiast, I have proved the advantages to be won in increasing track "mileage" and interest by adopting a two-level scheme. The track now in position measures some 300 ft. in length with the intention of adding another hundred feet soon.

Turnouts number twelve, with six plain or scissors type crossovers, and these will be added to as the track length increases. It will of course be evident to those conversant with such enterprises that many of the original six-foot lengths have been joined together and others have been judiciously cut to fit in with the general scheme.

The four locomotives now running were bought new or secondhand, but all have been rebuilt and improved. Most of the coaches and wagons have been built from scratch, but use will be made where possible of the many

The Cli bborn railway *in action, responding to push-button control, with father and son in command*

excellent kits now becoming increasingly available and which the oldest boy is now capable of assembling.

What then is there so fascinating about it? You can best tell me! I only know that visitors, male and female, young and old, seem to share the same fascination. To observe a train of some thirty goods vehicles start off slowly and steadily with ever-increasing speed controlled by a slight movement of a lever on a panel near by, and later to hear the oft-repeated click of buffer on buffer when the locomotive is reversed, is intriguing in the extreme. To have a locomotive travel over an array of pointwork accompanied by the "clickety clack" from the wheels of the coaches behind is indeed the real thing in miniature. To have now a set of tools acquired slowly over many years, capable of producing equipment in reasonable time, and to finish a job to one's own modest standards, is a tonic.

Where do we go from here, and what does it cost? Cost is far less than many a smoker spends each week on cigarettes—it is astonishing how much first-rate workshop equipment can be purchased secondhand, and to what extent the purchase of surplus disposals ex M.O.S. eliminates excessive costs for control gear and of components for prime movers. As for the future, it is intended, time and other interests permitting, to continue the fabrication of vehicles and motive power based on railway practices before the final railway merger of 1948 and to model some of the more spectacular of former private owners' wagons and vans of the pre-1939 period, incidentally creating something of historical interest.

Both my sons ask for information concerning details and characteristics of railway equipment and are at times inclined to argue with their father on matters which were in full flower long before they were born. These exercises in construction have the very practical value of convincing them that there are occasions when the old man is correct.

PREMIUMS FOR PURITY

By W. H. L. Hooper (Metals Division)

Very much purer coppers and copper alloys are now being produced at Metals Division under a new technique of vacuum melting. Why melt in a vacuum? Because it excludes the possibility of the molten metal combining with the oxygen in the air. As a result, the purer copper is much more suitable for certain uses such as in electronic valves and the alloys are less brittle and have greater fatigue strength. Some of the improvements are quite remarkable and open up a new field of scientific progress.

FORECASTS by imaginative newspaper reporters, after each spate of Sputnik trials, that the present generation may well live to see solar-powered factories built on platforms floating in orbit around the earth, offer a happy, if somewhat impracticable, solution to one of the most difficult problems faced by metal manufacturers. For the gases and vapours of the earth's atmosphere, which have always been the metal maker's worst enemy, fortunately cling closely to the earth's surface, and a factory operating a few thousand miles out in space would be beyond the last vestiges of the terrestrial blanket.

Other inspired journalists, seeking further afield and probably having a preference for firm land, propose building factories on the moon. But to the metallurgist the space-platform idea is more attractive, for we are informed by eminent scientists, whose opinion we must respect, that the moon does, in fact, have an atmosphere, admittedly very thin, but consisting of sulphurous gases quite ruinous to metals. Unhappily, with present limitations in space travel so sharply defined by "Phutnik" failures, the future does indeed seem far off, and we must regretfully come down to earth with our metal manufacturing schemes and try to create "outer space" conditions in existing factories.

This has, in fact, been made possible by rapid progress in the design of vacuum pumps stimulated by the demands of atomic energy projects, and vacuum furnaces are now available in which masses of metal weighing several tons can be melted, and cast into the form of forging billets or rolling slabs, in the complete absence of damaging gases. Indeed, not only is the surrounding atmosphere pumped away from the metal under process but, as the metal melts, all the gases entrapped in bubbles and blisters inside the raw lumps of the charge are drawn off also, together with adherent moisture, grease, and any unstable or volatile contaminating substances which have somehow found their way into the raw metal. Vacuum melted metals are therefore as pure and as sound as it is possible to make them on a commercial scale.

It might be as well, before discussing the development of vacuum casting at Metals Division, to consider in what ways the air we breathe is so bad for molten metals. There are, broadly speaking, three main reasons why it is desirable to melt metals in the absence of air.

In the first place nearly all metals combine with oxygen very rapidly when they are molten, and the oxide, or slag, has to be removed from the furnace before the metal is cast, and later sold at a loss to metal refiners, who recover the metal by means of costly chemical or smelting operations. In the case of titanium, reaction with oxygen is so rapid that virtually all the metal charge would be converted to worthless oxide if one attempted to melt it in a furnace used for producing the common metals.

Secondly, defects can arise in those instances where a metal can dissolve more gas while it is molten in the furnace than it can hold when it starts to solidify after it has been poured into a mould, so that gas bubbles are released and trapped inside the cast ingot. On subsequent hot forging not all these bubbles are welded up, and laminations, particularly liable to start off fatigue cracks in service, are left in the wrought material. Hydrogen dissolved in aluminium alloys is a typical case of this kind.

. . . it now becomes clear

Finally, in some metals gases not only dissolve in but actually alloy with the metal, forming hard, brittle compounds or particles. These particles can be either spread uniformly through the metal or link together to form films around crystal boundaries, but in both cases serious falling off in the engineering properties of the material can result, resistance to fatigue and to impact shock being particularly badly affected. Titanium is especially sensitive to this form of embrittlement, as little as 0·02% hydrogen or 0·1% nitrogen making the metal useless for structural purposes.

. . . pure copper

It now becomes clear, then, that when Metals Division decided to make titanium it was first necessary to design melting furnaces which would exclude all the reactive gases of the atmosphere. In the early days titanium was melted under the inert gas argon, but as work progressed and more experience was gained, the advantages of melting in a high vacuum became apparent. Our latest furnaces can operate at a gas pressure of less than a thousandth of a millimetre of mercury.

With this experience behind us it was an obvious step to apply vacuum processing techniques to the traditional products of Metals Division, namely copper and copper alloys. As far as pure copper is concerned, a potentially large market exists for a grade of high-conductivity metal which, when heated inside the high vacuum globe of electronic valves, will not emit gas and "soften" the vacuum, thereby lowering the efficiency and shortening the life of the valve. All the principal manufacturers of electronic equipment in this country have asked for samples of the Division's vacuum cast copper, and great satisfaction has been expressed with the quality of this new product.

Preliminary work on some of the stronger copper alloys, such as aluminium bronze, suggests that gains of up to 15% in fatigue strength are possible in vacuum melted material, and in every alloy so far examined it has been found that ductility and plasticity at temperatures in what has always been called the brittle range are very greatly improved. An intensive research campaign is planned for the future, taking into account many alloys which have very desirable engineering properties, but which are so difficult to make by conventional means that they have never been commercially exploited. It is hoped that several new materials for especially severe service conditions will result from these experiments.

So much for the products of Metals Division. But what are other metal industries in this country doing about vacuum melting and casting?

There is, in fact, a steadily mounting interest throughout the entire industry in using vacuum melting on a large scale. Leading manufacturers of high-grade steels on one hand and of high-temperature nickel-base "super-alloys" on the other have asked Metals Division to carry out melting trials for them in titanium melting furnaces. Results have been sufficiently encouraging to persuade these concerns that very real improvements in properties are possible merely by removing the gases and volatile impurities imprisoned in their present products.

But not only is a cleaner, sounder metal produced by vacuum melting; it is possible to add greater proportions of the usual strengthening alloying elements, and in some instances to use completely novel alloying additions in the vacuum furnace without embrittling the product and making it impossible to forge to its final shape. In the United States nickel-base super-alloys for ramjets, known under the trade name "Waspaloy," have thus been significantly upgraded as regards creep strength and hot ductility.

. . . only a few years ago

The first specification for air-melted "Waspaloy" required a rupture life of 20 hours at 816° C. under a stress of 27,500 lb./sq. in. As a result of initial vacuum melting trials this was revised to 40 hours at 816° C. and 37,500 lb./sq. in., and it was then possible to insist on a minimum 5% elongation before fracture. Shortly after this, improvements in vacuum melting technique allowed specification increases to 75 hours at 816° C. under 40,000 lb./sq. in., with 10% minimum elongation.

These are extremely worth-while improvements and have been repeated many times on well-established alloys, not only in the non-ferrous field but also on the special steels which only a few years ago were regarded virtually as the ultimate in engineering materials.

There is much to extol about vacuum processing of metals, and indeed one of the steel companies in this country has already started an advertising campaign to introduce a new range of vacuum steels. Metals Division is likewise considering publicising a range of vacuum cast copper-base alloys under a suitable trade name, yet to be chosen. As one of the principal merits of vacuum casting is gas removal, I rather fancy a slogan such as "Taking the wind out of our sales!"

TV ADVERTISING—DOES IT PAY?

By a special correspondent

I.C.I. has for the past year or so consistently used TV as one among several advertising media to boost 'Dulux,' 'Savlon' and 'Alkathene.' How effective is TV advertising? What will it do that printed advertising will not do? And where does it fail?

IF, turning out an old drawer or idling in a library, you ever come across a copy of *The Times* of some fifty-odd years ago, have a look at the advertisement pages. You are likely to see, as well as the familiar classified, whole columns reiterating some such legend as PEAR'S SOAP PEAR'S SOAP PEAR'S SOAP in type no bigger than this. That is roughly the stage of development commercial television has reached in this country today. And it makes any attempt at assessment both difficult and dangerous. So the first lesson of ITV is this: take a good pinch of salt with everything you are told.

But one fact must be true. British manufacturers are not easily persuaded to part with £41,000,000 a year simply to subsidise a free public entertainment service. TV advertising is getting results—and results which, pound by pound, compare pretty well with those produced by other forms of advertising.

What we are learning now is when and where TV is most effective, which are the products and problems for which it is more economical than, say, press or magazine advertising, and how within a given budget the best use can be made of all the available media—provincial and national papers, magazines, and posters as well as TV.

It is essential first of all to appreciate the basic difference between TV advertising and advertising in print—the difference between space and time. A reader can start in the middle of an advertisement, glance down to the base line, up to the illustration, turn over the page—and come back later to check a price or a detail or to show his wife the copy. On the other hand, he is perfectly free never to look at your advertisement at all.

A viewer, if the set is switched on and he is in the room, can hardly avoid seeing or hearing something of your message. But he cannot go back to look again. Not surprisingly, the advertiser—paying perhaps £30 a second for the chance to speak to six million viewers—concentrates his message into the most tightly capsulated form, shouts it, sings it, repeats it again and again. PEAR'S SOAP PEAR'S SOAP PEAR'S SOAP has become "Not just a blue, more than a blue . . . a new blue whitener" and so on.

Not all TV commercials are so unsubtly insisting. But at the moment a lack of subtlety often pays. Repeated appearances are necessary to secure memorability. Sandwiched between a "western" and a quiz show, jostled on either side by other strident voices selling other products, each "spot" must struggle to make its impact quickly.

. . . clearing out an old drawer

In this struggle every trick of film production and presentation is currently being exploited. Cartoons, puppets, and trick photography of every kind are some of the principal weapons being used, and it is not unusual for a 15-second commercial to contain more optical devices (e.g. fades and the various kinds of "wipe") than a full-length cinema feature film. All this makes the job of producing TV advertising immensely exciting. But how does the audience react?

So far, it is safe to say that most of the people who have any developed feelings about the commercials enjoy them. It is not always so easy to make them remember the products which they are selling. When TV really produces sales results it produces them fast—jamming the wires if you proffer a phone number, emptying the shops the following morning if you have a new product with an appealing story. But the effect is transient—more so than with other forms of advertising. It is easy to become known on TV; but, as many politicians and entertainers have discovered, staying known calls for heroic efforts.

These limitations suggest some of the more successful functions for TV advertising. To launch a new product—especially one with advantages which can be easily and convincingly demonstrated—nothing is so rapid and economical as television. No major grocery or cosmetic product could hope for a reasonable measure of support today without the backing of TV, and the record of successful launching campaigns in which only television was used is already an impressive one. In the same way television has been effectively used to sell tomorrow's newspaper and the film showing at the local cinema.


. . . start in the middle

Established products, which need only to give an appropriate reminder of their name to stimulate sales, are well served by television, especially if it is supported by advertising in other media. Soaps and detergents, petrols, roll films and cosmetics are good examples in this category.

More durable goods—washing machines, refrigerators, vacuum cleaners, cars—gain enormously from television's powers of demonstration, but they are rarely what are called "impulse purchases." In most families a purchase of such a size is the outcome of careful consideration, comparing and contrasting prices and styles in some detail. The favourable impression which a television commercial can make represents only the first step towards clinching a sale: the part played by press advertising and by the individual salesman cannot be underestimated. But neither should the effect of such television advertising on the salesman be overlooked. There is little or nothing on television at the moment which can be called prestige or institutional advertising. The audience is too indiscriminate, the cost is too high, and the long-term effects are too incalculable for any such move. But that is not to say that such a development will not come: almost certainly it will, though it may not be possible until changes in programming or the creation of further alternative programmes make a more selective buying policy possible.

To sum up, then. TV advertising has urgency and excitement, tremendous initial impact and movement, but not a great deal of staying power. Most people do not resent TV commercials; the majority actively enjoy them, but the measure of their enjoyment may bear no relation to the selling power of a given commercial. We do know, however, that competently planned, imaginatively produced TV advertising will produce sales at a cost certainly not exceeding the cost of advertising in other media, and almost certainly very much quicker. We know, in fact, quite a lot of things that television advertising will do; we cannot be sure yet that we know what it will not do. And we may all have a lot of surprises to come.

'PROCION' DYES (*continued from page* 331)

retirement in September 1947. However, it was not until 1952 that experimental work got under way again to find the why and wherefore of these peculiar wool dyeings.

Mr. Rattee in the Dyehouse was involved in checking the previous work, and at the same time Dr. Stephen in the Research Department initiated experiments to find different dyes containing reactive chlorine atoms derived from cyanuric chloride. These were tested on wool, and although they varied a little from the original types they showed no promise of being commercially attractive. Very close collaboration was maintained by Stephen and Rattee, and the outcome of this harmony led to an extension of the experiments in application from wool to cotton. From previous experience it was not to be expected that the dyes would colour the cotton fibre. Mr. Rattee's first results confirmed this, but he noticed that the slight stain or tint which formed on the cotton was very resistant to removal by soap and water. Further work, first by Rattee and then by many colleagues in the Dyehouse, produced commercially acceptable dyeings while still retaining the high washing fastness.

Dr. Stephen perfected the process details in the laboratory and the Production Department arranged for large quantities of the first three 'Procions' to be prepared. This involved the works at Huddersfield, Blackley, Trafford Park and Grangemouth, as well as trials on the experimental plant.

New and improved methods of application were turned up month by month, and all this added to the commercial and technical excitement of presenting the world's first reactive dyes to the textile industry in April 1956.

Imitation is said to be the sincerest form of flattery. 'Procions' have stimulated Swiss, German, Japanese, Chinese and American dyemakers to seek alternative reactive systems. Some of these have been partially successful, but I.C.I. still forges ahead.

NEWS IN PICTURES

British Association—1. *Sir Alexander Fleck, who is this year's president of the British Association, delivered his inaugural address in St. Andrews Hall, Glasgow, on 27th August*

British Association—2. *Sir Alexander Fleck unveiled a plaque at Glasgow University to the memory of Professor Frederick Soddy, the Nobel prizewinner. As a former student of Professor Soddy's, his was one of the four names inscribed on the rim of the plaque*

British Association—3. *Nobel Division staffed the British Association press office at the meeting. Sir Alexander Fleck is seen with two of the team, Miss K. Johnston (left) and Miss Jean Hunter*

British Association—4. *After presenting the prizes Sir Alexander was photographed with the "Endeavour" Essay prizewinners at St. Andrews Hall. On Sir Alexander's right is Mr. Charles Perrin, who won the first prize, and extreme right back row is Dr. T. I. Williams, the editor of "Endeavour."* (*See story on p.* 334.)

TV choice. *Robert Minshull (front row, third from left), a lab assistant from Salt Division, was recently chosen to take part in the Granada TV panel programme "We Want an Answer."* (*See p.* 333.)

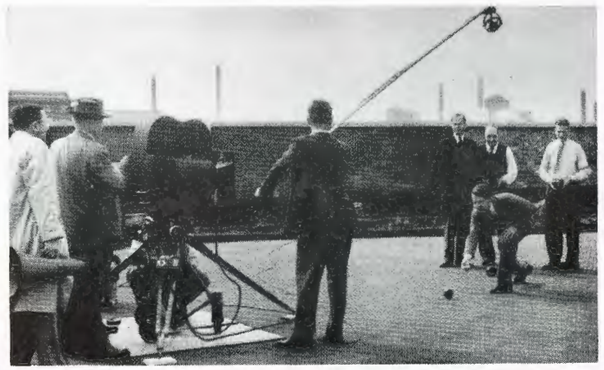
"Bobbin boys." *At Fibres Division's 'Terylene' warehouse, boys are employed to examine bobbins returned by customers. These twelve boys were recently appointed group leaders and were presented with a bobbin-shaped badge to denote their new status*

Mr. Danny Mahony *of Billingham Division, now on National Service in Berlin, was recently chosen to shoot in the British team against the American Forces*

"Malaguena" *was the tune which won Mr. Roy Dodsworth of Billingham Division another holiday at Butlin's Skegness holiday camp when he played his harmonica in a national talent contest*

On his toes. *Mr. Graham Storer of Lime Division received a cheque for £26 when his suggestion of a design for a clip to hold toeboards to scaffold tubing was adopted by the Division*

Their own work. *Much of the work was carried out by Billingham Division apprentices when a brick cycle shed was converted into this new electrical workshop*



Chris Chataway, *the TV commentator and athlete, is seen here trying his hand at bowls on one of the greens near Alkali Division's Winnington Works. The scene was being filmed as part of the film "New Minds for a New World," being made for I.C.I.*

Mr. C. Hugill *(Billingham Division), a well-known umpire in the North Yorkshire and South Durham League, receives a retirement gift from his colleagues*

Mr. Hugh King, *aged 92, and his son Edward, who retired from Billingham Division two years ago, are both I.C.I. pensioners. Their 87 years' service with I.C.I. and its predecessors is only part of an outstanding family record*

Mr. Ron Barber *(Paints Division) has retained the cup won last year at the Needham Market Flower Show. Among other floral awards this year he has again won a competition for the best-kept council house garden at Gipping*

Bomb doctor. *Mr. R. Morton (Nobel Division) commands 546 Bomb Disposal Squadron R.E. (A.E.R.) and has just returned from a fortnight's training camp. Here he is using a stethoscope to listen for a reaction from a clockwork fuse in a bomb*

The biggest yet. *This 80-ton strip wound pressure vessel which was delivered recently is the largest of this type of construction to be supplied to Oil Works, Billingham, and the biggest in outside diameter yet made by the manufacturer, Phoenix Rheinrohr, of Mulheim, Germany. It is seen in the picture above on the special lorry which brought it by road from Hull*

Pink elephants? *No; this amiable elephant taking a stroll past the site of the new Alkali headquarters was part of a circus which was one of the main attractions at the recent Divisional gala*

Fire-fighters. *Three Billingham teams took part in the London finals of the Industrial Fire Protection Association's fire-fighting competition recently. Here Billingham Gas and Power Works team are seen practising trailer pump drill*

Loading ash. *Our picture shows a close-up of Alkali Division's new conveyor system for loading ash in bulk direct from the process to a ship. By using two chutes it is possible to load both fore and aft holds consecutively*

Billingham Synthonia *Recreation Club sports field. The new sports field was opened on 6th September by the Earl of Derby. Our picture shows part of the stand and the 440-yard track. Adjacent grounds totalling approximately 55 acres cater for various other sports, including cricket, tennis, bowls, rugby and hockey*

Barbecue. *At Plastics Division's recent "At Home" two pigs were roasted at the barbecue, which was a great attraction*

Directors v. Pensioners. *At the annual bowls match at Ardeer Recreation Club. Left to right: Mr. H. S. Sayles, Dr. R. R. H. Brown, Mr. John Arnott (retired), Mr. Tom Bryce (retired), Mr. William Lumsden (retired) and Dr. A. D. Lees (Nobel Production Director)*

PICTURES FROM OVERSEAS

Belgium. *Mademoiselle R. Zeghers, a Belgian receptionist/interpreter on the I.C.I. stand at the Brussels Fair, and Mr. D. H. Duff of Central Purchasing Department (back to camera) watch Mr. Kucherenko, Vice-President of U.S.S.R. Council of Ministers, sign the visitors' book*

Australia. *The Governor of Victoria, General Sir Dallas Brooks, accompanied by Dr. G. L. Moffret, the factory manager, was intrigued by "space-age" safety clothing when he visited the Nobel Factory after officially opening the recent Deer Park Regional Safety Week.* (*See page* 355)

Trinidad. *Our picture was taken at a reception in honour of the I.C.I. three-man work study team which recently visited the West Indies. The team met Sir Grantley Adams, Prime Minister of the West Indies Federation (far right). Also in the picture are (l. to r.) Mr. J. O'Halloran, Minister of Industry and Commerce, Mr. R. M. Currie and Mr. G. Weston (Technical Director, British Standards Institute)*

Night Attack at El Alamein

By Gordon Long

THE 15 cwt. truck crashed and bumped its way over the desert. In the back of it were my brother and I, loaded down with full battle equipment, choked with dust, each as sick as a dog through the frightful motion. The Western Desert is not the world of softly undulating sand dunes associated with the Hollywood epic *Beau Geste*. For the most part its sands only just conceal a bed of limestone, sharp and pointed, hard and unyielding—the very devil to ride over, heartbreaking when you are in a hurry to scrape some sort of shelter in it.

We had been rocketing along over it for hours and hours. That October morning we had left our own crowd, a tank regiment, to join a battalion of the Green Howards. Both of us had already been in the desert war for a year, but having recently been selected as potential officer material we were being seconded for three weeks' experience with the infantry before taking an abbreviated officer training course at the Middle East O.C.T.U. at Acre in Palestine. I make this point only to establish the fact that we were tankmen, with no experience whatsoever of infantry training or fighting. So if my impressions of the Battle of Alamein, then only twenty-four hours away, strike some old P.B.I.s as rather naïve, here is the explanation.

We of the 8th Army always referred to the battle zone as the Sharp End. Somewhat like the Ark of the Covenant, it was distinguished by pillars of smoke by day, and at night by fiery glows that blazed suddenly and as suddenly died anywhere along the sixty miles from Alamein on the coast down to the Qattara Depression.

We knew we must be near the Sharp End now. It was late afternoon; we had been lurching along on a bearing more west than south for some considerable time. Now a low rumble told us we had not far to go —unless, of course, the unseen R.A.S.C. driver out front was going to run straight on into the Jerries. That sort of thing happened rather more than often. In a place as big and featureless as the desert it was all too easy.

Quite suddenly we breasted a low ridge and began careering down into a wadi or small valley. Looking rearwards over the tailboard we saw the collections of little one-man bivouac tents—"bivvies"—typical of any British infantry regiment in a state of semi-alertness. The truck rumbled to a halt and put us down outside a slightly larger tent, which would be battalion headquarters. We went in and saluted an officer seated behind a small collapsible table. A young man with a crown and pip on his shoulder, not a day over 25, I would have guessed. Certainly some years younger than me. He was the first of the very young colonels I had during the war, and a wonderful soldier. Maybe in modern industry many managers are in their prime at 50, but in my experience the most effective leadership for a *fighting* regiment is almost invariably obtained from a man half that age. He is not dogged by hindsight or deterred by foresight. Because of that he makes up his mind quickly—and in war that can be worth all the gold in Fort Knox, even if the decision is faulty.

I won't dwell at length on the little that was left of that day, the eve of the battle. Suffice to say that the Colonel, having read the documents we had brought with us, swore in terms which were military and not reproducible here. What was G.H.Q. thinking about? Did we know that the balloon was just about to go up, and had we any knowledge of the infantry at all? When we answered in the negative, he was so deeply moved as to invoke each of the Trinity.

However, at least we had arrived at the Green

Howards: this was journey's end. We were taken away, given some tinned bacon and biscuits and issued with blankets and bivvies, but sleep was still far off. Most of that night, in company with our new comrades, we plodded and crawled about the desert in rear of our positions, simulating an attack which everyone seemed to know to be imminent.

We woke dirty and sore from a very brief repose, but we had been lucky, really. The battalion's fighting patrols had been out all night, bellying their way over to the enemy's lines, getting in behind those lines, chucking their grenades about and drilling great holes in the night with their tommy guns; in short, generally making life pretty like hell for the opposition. Sometimes these patrols had to bring back a prisoner, and that was a tricky business—unless, of course some miserable Jerry or Eytie, plagued by dysentery, had to get up in the night and, armed with a spade, go and seek relief for himself at some decent distance from his fellows. Such a one was a sitting duck, if ever was. A quick rush, a bang on the head with the butt of a gun, and the bird was yours.

But a night on fighting patrol was a pleasure reserved for us until some days later. To revert, I had reached the point of our awakening into a golden, sunlit world somewhere in the Deir el Munassib Depression on the day of a battle that was to last eleven whole days, each of interminable length, but that was to stop the roll-back of Allied hopes and be the springboard for victory.

Not that any of us entertained such grandiose thoughts that morning. The combat soldier, in my experience, is generally the least bellicose of individuals, the least likely to dramatise a situation. Bellicosity is for people with slippers on, or buried deep in club armchairs. Up at the Sharp End you grow in respect for the opposition, for his courage and tenacity. Moreover, suspecting that, like you, he rarely gets his full rations (tins of milk, etc., are "knocked off" on the long way up) and knowing that he lives in the same dirt and discomfort, you regard him with something akin to brotherly affection, and conserve your hatred for the shower of all ranks back at Base who sleep between sheets, draw staff pay, and go necking the lovelies of Cairo's exclusive Gezira Club every evening.

Looking westward that golden October morning we could discern every detail of the scene that nature had set for our little part of the battle. Before us, beyond the folds in which the Green Howards cleaned and oiled their weapons, wrote letters, or just lay on

Imperial War Museum

A smoke screen attack *at El Alamein. Australian infantrymen are closing in on a strongpoint.*

their backs, stretched 1600 yards of dead flat sand. Out of it at the end rose two cone-like features, maybe 100 ft. high, and beyond that again a limestone ridge, rough and ragged from the blasts of centuries of sandstorms. Nothing moved. It was difficult to believe that that ridge and its guardian pimples must be riddled with gunpits, swarming with enemy soldiers. On our sector there was no noise save that made by the myriads of pestilential flies that buzzed about our mouths, eyes and nostrils, searching for a soft, wet membrane to sit on and suck.

The morning passed in general chores. About noon we winkled our way cautiously rearwards to the cooks, who, their apparatus laid out in the wadi, had prepared a bully stew for our by this date nerveless palates. In the meantime field gunners came rolling up, fine trim fellows, cleaner and tidier than us. We watched them as they unlimbered their 25-pounders and began digging in and camouflaging with scrim netting. I never saw so many guns before. They seemed to be less than 25 yards apart and to stretch as far as the eye could see in both directions, their long grey barrels glinting in the sun.

About 2.30 an astonishing spectacle presented itself. A football booted by someone in the rear suddenly bounced past us down on to the smooth sands below. In a trice a match was in progress, eleven a side, and I will take an oath that at least half the game was in full view of the enemy. They played,

these Green Howards, for about an hour, and a spirited game it was. Meanwhile not a shot was fired either way. As everybody now knows, a sense of old-fashioned chivalry manifested itself on both sides in the desert war. I believe that the enemy watched that game and was restrained by sporting instincts from interfering. However, it had hardly ended when we had to duck. Screams overhead heralded mortar bombs whistling down. Watching the bursts, however, one quickly realised that they were ranging not for us but for the 25-pounders behind. Sure enough they eventually got one, overturning it and wounding some of its crew. Then they stopped, and again our little bit of no-man's-land was nothing but peace.

Later in the afternoon each man got his iron rations and his proper allotment of ammunition. Then each sorted out his kit, jettisoning all but the permitted essentials, a change of socks and washing kit. These preparations were not without their significance, and I began to have the first real feelings of apprehension. If some people ever get adjusted to battle, certainly I never did.

At about 6.30 the sun went flaming down behind the ridge, and in the swiftly gathering darkness we ate our evening meal of bully stew and tea. I had just finished cleaning my greasy messcan with a handful of sand when a sergeant came barging around. "Attack goes in tonight!" he said in a sort of bellowed whisper. His voice trailed away in the darkness, punctuated by curses as he tripped over the unseen ropes of countless bivvies.

The next two hours hung very heavily for me, but other people were extremely busy. Before the moon came up, engineers must have been out in no-man's-land searching the ground for mines. They had established a clear road straight out towards the enemy for about 800 yards. This they had marked either side with broad white tapes, like kerbs. Further to indicate the route, they had flanked it at intervals with lanterns, so masked as to be visible only to oncoming troops. Beyond the tapes, of course, we would be travelling well and truly at our own risk, for the enemy's positions were completely protected by a minefield of some depth, its perimeter marked by a low stretch of wire. We would have to traverse this to get to grips, and a walk in a minefield was going to be an entirely new experience for me.

At about 8.30 we paraded behind some high ground, nearly 700 men, and most of them Yorkshire boys from around Bridlington. By this time the moon was high in a velvet sky. Behind us the Milky Way was a billion lights. The desert always presented a night sky of incredible beauty.

There were A Company and B Company, with HQ Company somewhere in the rear. We stood to attention . . . at ease . . . easy. Our shadows stretched like long patches of ink. We shivered in our cotton shirts—the desert night can be terribly cold. But then someone came round with the rum issue, and in the spluttering and coughing that followed the downing of the fiery liquid, tension was relieved.

Then our young colonel appeared. He said he had a message for all from this new general, Montgomery. He would proceed to read it. By the light of the moon he told us that the battle about to commence would begin a rout that would see the enemy driven right out of Africa. This would be an historic battle, the final turning-point. I have preserved a copy of the actual message, which is reproduced here.

Afterwards there was some good-natured chuckling. Some of the older hands had heard this sort of thing before, but our earnest young company commander quelled it. This was the genuine thing, he assured us. We'd keep going until they were driven into the sea. And what then, if not back to Blighty? This raised a big cheer.

Ten minutes later we were reformed and moved off straight into no-man's-land in column of threes. There was not a sound save the rhythmic crunch, crunch of

our boots. When we had reached the start of the tapes, I ventured to look back. The battalion was marching straight at the enemy. Marching! I could not believe my senses. Surely the enemy could see us? If he did, he certainly did nothing about it—not yet.

After about 800 paces we halted. The Assembly Line had been reached. Our Company, B, was to move to the left to launch an assault on the ridge; C Company was to fan out to the right to put in their attack between the pimples. A Company would be held as reserve. It was a very brief stop, and soon we were going forward again, the dust swirling round our feet.

The last pair of lanterns was getting quite close. Still not a sound but the crunch of boots and the clink of equipment. The column halted again. We had reached the Start Line. Battle formation was taken up, the men fanning out to take up positions five yards apart, with Battalion Headquarters behind, and behind them again a huge concourse of carriers, mortars and anti-tank portees. All was silence as the Green Howards fixed bayonets and knelt on one knee.

Suddenly out of the stillness of the night there came a single dull boom from somewhere far behind, and a single shell screamed over our heads to burst with a tremendous crack high up on the ridge. A plume of smoke curled lazily away. That was the signal. We got to our feet, rifles at the ready, and went forward.

It was only a matter of seconds before the air overhead became filled with noise. A hundred shells from a hundred British guns were screaming over us, their different notes, some low, some high, making a kind of music, rich and resonant, like the notes of some gargantuan pipe organ.

Behind us we could hear the guns themselves bellowing in little jerks—doom-doom, de-de-de-doom. We were now approaching the wire protecting the enemy's minefield. Our carriers came through and threw grappling hooks over the wire. The wire must have been mined too, for the whole perimeter of the minefield at once exploded. The carriers backed away out of the smoke—all except one. The young driver's blond head was lolling backwards. I helped to lift out his quivering body and lay it in the shelter of the carrier. I felt my hands and arms warm and sticky. They were covered with blood.

It was only then, I think, that the enemy began to hit back in earnest. Hell seemed to break loose all of a sudden. There was a tremendous explosion on my left—the blast of it knocked me over; another on the right; then another straight in front. Great gouts of smoke rose in the still air; the smell of cordite choked me. The air was full of the pee! pee! of bullets, and great jagged pieces of metal went hurtling past with raucous, rattling sounds.

Through occasional clearances in the smoke I discovered that our thin khaki line was getting sensibly thinner. I saw several of our chaps pitch forward and lie still. The fellow immediately on my left—a nice young chap, almost a boy—suddenly uttered a dreadful cry. I turned away, sickened at the sight. Of course, he was beyond help, and in any case every man on his feet and able to go forward had to keep going. Who could tell? Perhaps the worst of the fighting, the real challenge, would only come when we had made the ridge. Then every man would count. On we went, silently, doggedly, amidst the tumult.

The din continued to increase in fury, a new note being added by some largish projectiles, probably 88 millimetres, which went by with a sound like tearing calico. For some minutes we lay prone in the minefield—and how glad I was to stop in it! Every single step in this area, every inch of innocent-looking sand, carried with it the threat of mutilation. But soon we were on our feet again, only to find that we were also being shot down from behind. A machine gun nest had not been cleaned out. Our company commander shouted something above the clangor. Whether his words were distinctly heard or not was of no moment; their purport was understood. Brandishing his revolver he set off rearwards towards the enemy gunners, and was immediately joined by five of his men. On they went, firing from the hip at the jets of flame that stabbed the darkness ahead. Soon they were on a knoll, out of which there suddenly rose other figures, so that the company of six became nine or ten. Then there ensued that most terrible thing in war—a hand-to-hand grapple, with fists, feet, gun butts—anything, everything. Then it was all over, and the Company Commander was back with us, leading the party on the final assault of the ridge.

I jumped into a big gunpit with a shattered 88 in the centre. All its crew were very dead. Another machine gun just ahead of us, firing tracer, held us up and would not be stilled. A general call went up for one of our machine-gunners, one of the few soldiers I ever met who could fight with undiluted hate (he had lost his brother in the war and his mother or sister in the blitz). He lay down in the darkness not fifty yards from the enemy gunner and settled behind his Bren. He too was firing some tracer, and we watched the

EIGHTH ARMY

Personal Message from the ARMY COMMANDER

1—When I assumed command of the Eighth Army I said that the mandate was to destroy ROMMEL and his Army, and that it would be done as soon as we were ready.

2—We are ready NOW.

The battle which is now about to begin will be one of the decisive battles of history. It will be the turning point of the war. The eyes of the whole world will be on us, watching anxiously which way the battle will swing.

We can give them their answer at once, "It will swing our way."

3—We have first-class equipment; good tanks; good anti-tank guns; plenty of artillery and plenty of ammunition; and we are backed up by the finest air striking force in the world.

All that is necessary is that each one of us, every officer and man, should enter this battle with the determination to see it through—to fight and to kill—and finally, to win.

If we all do this there can be only one result—together we will hit the enemy for "six," right out of North Africa.

4—The sooner we win this battle, which will be the turning point of this war, the sooner we shall all get back home to our families.

5—Therefore, let every officer and man enter the battle with a stout heart, and with the determination to do his duty so long as he has breath in his body.

AND LET NO MAN SURRENDER SO LONG AS HE IS UNWOUNDED AND CAN FIGHT.

Let us all pray that "the Lord mighty in battle" will give us the victory.

B. L. MONTGOMERY,
Lieutenant-General G.O.C.-in-C., Eighth Army.

MIDDLE EAST FORCES,
23-10-42.

A facsimile *of General Montgomery's famous eve of battle message to all troops at El Alamein*

bullets race at one another across the darkness, but soon the enemy gun spluttered and was silent. We pushed on.

The enemy was scattering in all directions now. We could see them silhouetted against moon-bathed pinnacles. We swarmed up in pursuit, with a grenade for every fold in the ground, a bullet for everything that moved. Here we saw the havoc wrought by our 25-pounders. There were enemy dead everywhere and gun emplacements blown to smithereens. Our commander strode along the ridge in full view, calling upon the enemy to come out and surrender. He had not long to wait. Long lines of figures suddenly issued from nowhere. In single file, hands above their heads, more than fifty. And as we looked, another column appeared from behind us, almost as big. We lined them up and frisked them for weapons before they were led back. I watched them, miserable and dejected but not without pride, still soldiers. A few moaned or sobbed from their wounds. They passed by our own stretcher bearers who were slowly working forward, lifting our fellows. I raised my eyes and saw to my amazement that the dawn was already coming up. We must have been fighting and mopping up for all of seven hours. I could not believe it.

We began digging in on the ridge—at least everybody began digging except my brother and me. We had not been issued with entrenching tools. We eventually found some long-handled enemy spades, but the hardest blows with them only rang on the solid limestone. It was now full light, and we had achieved no more than a shallow scrape when once again the air became filled with wailing shells and mortar bombs. We pressed ourselves flat to the trembling earth and held our breath. One of our chaps, hit in the head, got up and began wandering around, a poor demented creature. The air was full of screaming metal. Mercifully, before he could be hit again, he stumbled and fell, and someone laid hold on him to keep him down. For ten uncomfortable minutes it went on, with never a let-up and precious few duds. Then—utter silence. For the moment they were letting us be.

And there we were, one English mile further along the road to Cap Bon.

"The Well"

Photo by Miss Isobel McLellan (Millbank)